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FOREST INSECT CONDITIONS
IN THE
CENTRAL ROCKY MOUNTAINS
1957

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by

A. E. Landgraf and H. E. Ostmark

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ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION
Raymond Price, Director   Fort Collins, Colorado

EST SERVICE   U. S. DEPARTMENT OF AGRICULTURE

FOREST INSECT CONDITIONS IN THE CENTRAL ROCKY MOUNTAINS

- 1957 -

by

A. E. Landgraf and H. E. Ostmark, Entomologists

Rocky Mountain Forest and Range Experiment Station

The station maintains central headquarters at Fort Collins, Colorado, in cooperation with Colorado State University. The authors are assigned to the station's Forest Insect and Disease Laboratory at Fort Collins.

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INTRODUCTION

This report covers the status of insect activity during 1957 in the forested areas of Colorado, Wyoming, South Dakota, Nebraska, and Kansas, as determined by aerial and ground surveys.

The aerial survey covered an estimated 26 million acres of Federal, State, and private forests. Procedure and techniques developed by the Pacific Northwest Forest and Range Experiment Station were modified to fit central Rocky Mountain conditions.[1]

Nine infestations were appraised on the ground: 4 Douglas-fir beetle, 2 mountain pine beetle, 1 Engelmann spruce beetle, 1 spruce budworm, and 1 Great Basin tent caterpillar. In addition, 33 infestations reported by cooperators were inspected. Of these, 19 were on national forests, 9 on private land, 4 on national parks and monuments, and 1 on Colorado State land.

Laboratory personnel worked with national forest officers on 3 bark beetle control projects on national forests and with the State Forest Service of Colorado on a Great Basin tent caterpillar control project. The tent caterpillar control project was carried out cooperatively by the State of Colorado, Huerfano County, Walsenburg, LaVeta, Cucharas Camps, and the U. S. Forest Service.

PROCEDURES FOR EVALUATING FOREST INSECT DAMAGE

Aerial Surveys.--Aerial surveys are efficient for detecting, delineating, and determining the severity of insect infestations. This information is recorded on 1/4-inch or larger planimetric base maps. In addition, information for planning control and salvage operations is obtained.

Standards for classifying the degree of damage by defoliators and bark beetles were developed. The criterion for classifying damage by leaf feeding insects is the severity of current season's defoliation. These defoliation classes are:

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[1] Wear, J. F. and Buckhorn, W. S. Organization and conduct of forest insect aerial surveys in Oregon and Washington. U. S. Forest Service, Pacific Northwest Forest and Range Experiment Station. 40 pp., illus. March 1955.

Degree of damage	Description of classes
Spruce budworm	
Light	Defoliation light, barely visible from the air.
Moderate	Top one-fourth of tree defoliated.
Heavy	One-half of tree defoliated, top killing in progress.
Very heavy	Three-fourths of tree defoliated, some tree killing in progress.
Dead	Defoliation complete, general tree killing.
Great Basin tent caterpillar	
Light	Defoliation light, barely visible from the air.
Moderate	One-half of tree defoliated.
Heavy	Complete defoliation
Very heavy	Complete defoliation, some tree killing.

The criterion for classifying bark beetle damage is the number of current "faders." Trees killed by bark beetles usually do not fade until 1 year after becoming infested. Consequently, the figures for bark beetle losses in 1957 are largely the 1956 losses. These classes of bark beetle damage are shown in table 1.

Ground surveys.--Ground inspection and appraisal surveys determine the status and trend of insect infestation and the need for control. Inspection surveys are often conducted first to determine quickly the size, severity, and status of the infestation. This information is the basis for determining whether an appraisal survey is needed. For small areas with few infested trees, the inspection survey is adequate. Inspection surveys are made whenever detection reports are received. In addition, all major infestations observed during the annual aerial survey are inspected.

Table 1.--Classes of bark beetle infestations used for aerial surveys in the central Rocky Mountains

Degree of infestation	Timber types			
	Ponderosa pine Limber pine	Lodgepole pine	Douglas-fir	True firs Engelmann spruce
	No. trees per acre			
Light	0.1-0.2	0.1-0.5	0.1-0.3	0.1-0.3
Moderate	.3- .4	.6-1.5	.4- .6	.4- .6
Heavy	.5- .8	1.6-4.0	.7-1.2	.7-1.2
Very heavy	.9+	4.1+	1.2+	1.2+
	Maximum trees per group			
Light	5	25	5	5
Moderate	10	50	15	15
Heavy	20	100	30	30
Very heavy	Large	Large	Large	Large

The intensity of ground sampling depends upon the size of area, severity, and uniformity of an infestation, and accuracy of estimate desired. In a systematic appraisal survey for bark beetles, parallel sample lines are spaced evenly throughout the infestation. The percent coverage desired governs the distance between the lines. For sampling Engelmann spruce beetle infestations, 1/10-acre plots are spaced at 2 chain-intervals along the lines.[2] A continuous 1/2-chain wide strip is used in Black Hills and mountain pine beetle surveys.[3] The number of currently infested trees and number of trees killed the preceding year are tallied in the plots or strips. Degree of woodpecker feeding, stand conditions, and topography are also recorded. Bark samples from 25 infested trees (randomly selected) show number of live and dead insects, stage of development, inches of egg gallery, numbers of parasites, mites, predators, competitors, and any other mortality factors.

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[2] Knight, F. B., McCambridge, W. F., and Wilford, B. H. Estimating Engelmann spruce beetle infestation in the central Rocky Mountains, U. S. Forest Service, Rocky Mountain Forest and Range Experiment Station. 12 pp., illus. August 1956.

[3] Knight, F. B., Methods of surveying infestation of the Black Hills beetle in ponderosa pine. Forest Sci. 4: 35-41. March 1958.

Other types of sampling systems are used to appraise damage by defoliators. A sequential sampling system described by the Intermountain Forest and Range Experiment Station[4] is being tested on spruce budworm infestations, with initial satisfactory results.

Defoliation by the Great Basin tent caterpillar is predicted from fall sampling within the infested area. Egg masses are counted on 5 trees selected at random on each of 1 to 3 plots within each area. Complete defoliation is predicted if the average number of egg masses on each main branch exceeds one.

ENGELMANN SPRUCE BEETLE

(Dendroctonus engelmanni Hopk.)

The Engelmann spruce beetle is now endemic throughout the region. An estimated 2,200 acres of infested spruce were mapped during the 1957 aerial survey. The infestations are light to moderate.

Two small areas will be treated in 1958. One is on Red Table Mountain on the White River National Forest (20 trees); the other, at the head of Illinois River on the Routt National Forest (800 trees). The Illinois River infestation of approximately 100 acres is to be used for an ecological study.

Spruce blown down in the fall of 1954 on the San Juan National Forest were still susceptible to spruce beetle attacks in 1957 (table 2). Sampling of four plots revealed few egg galleries and live spruce beetle brood per square foot of bark surface.

After a 2-year decline in the spruce beetle population in the vicinity of High Park Lake on the Grand Mesa-Uncompahgre National Forest, a blowdown of approximately 1.000 spruce may again build the beetle populations to an epidemic level.

A more recent spruce blowdown exists on the Eagle and Holy Cross Districts of the White River National Forest. Unusual weather conditions on September 13, 1957, produced tornado-like winds over the spruce-fir type on the two districts. The results of the aerial survey, made by a helicopter, show wind damage from

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4/ Cole, Walter E. Sequential sampling in spruce budworm control projects. U. S. Forest Service, Intermountain Forest and Range Experiment Station. 20 pp. Unpublished manuscript 1956.

Fulford east to Redcliff, Colorado.[5] Areas of complete blowdown are in Triangle Creek, West Lake, Middle Lake Creek, East Lake Creek, Beaver Creek, West Grouse Creek, Grouse Creek, and Cross Creek drainages.

Table 2.--Results of 1957 sampling of windthrown spruce - San Juan National Forest

Plot	Type of blowdown	Trees	Engelmann spruce beetle egg galleries 1/	No. of live insects (all stages) 2/
		No.	No. per sq. ft.	
Big Bend	Open	25	.04	3.6
	Shaded	25	.92	3.2
Cascade Creek	Open	25	.40	2.5
	Shaded	25	.84	3.4
Junction Creek	Open	25	.16	3.8
	Shaded	25	.08	.6
Grayrock	Complete	25	.40	5.6
	Scattered	25	.58	6.8

1/ Includes 1955, 1956, and 1957 spruce beetle galleries.

2/ Includes brood from 1956, 1957 attacks. The 1955 brood had emerged.

BLACK HILLS BEETLE

(Dendroctonus ponderosae Hopk.)

Black Hills beetle infestations cover 56,910 acres of ponderosa pine type in Colorado, Wyoming, and the Black Hills of South Dakota (table 3). The estimated volume loss is 2.7 million board-feet.

Infested trees are readily spotted by fading foliage and conspicuous pitch tubes. Since the trees are generally accessible, they are treated or salvaged soon after being infested. Continued surveillance and prompt action should eliminate the need for large control projects.

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[5] Burke, J. P. Tornado damage, White River National Forest, 1957. U. S. Forest Service, Unpublished report.

In 1957, the largest chemical control projects were in Naturita Canyon on the Uncompahgre National Forest and Bear Mountain District of the Black Hills National Forest. On the Naturita Canyon project, 1,121 ponderosa pines were treated. Trees were felled and sprayed with an emulsion of ethylene dibromide.

On the Bear Mountain project, 1,399 infested ponderosa pines were treated. The ethylene dibromide was applied to standing trees by the use of jeep cans and stirrup pumps.

Two thousand infested ponderosa pines on the Bailey District of the Pike National Forest are scheduled for control in 1958. This area was first treated in 1949. Since then, treating has been negligible.

The Roosevelt National Forest plans to treat 200 infested ponderosa pines with an oil solution of orthodichlorobenzene in the vicinity of Gross Reservoir.

The State of Colorado in cooperation with Denver Mountain Parks treated 86 infested ponderosa pines on Lookout Mountain, west of Golden, Colorado.

The Black Hills beetle is increasing on the San Juan National Forest. Groups of faders were more numerous in 1957 than in 1956 (table 3) in the Blanco Basin area on the Pagosa Ranger District. Two hundred infested ponderosa pine in Coon Creek drainage will be treated.

DOUGLAS-FIR BEETLE

(*Dendroctonus pseudotsugae* Hopk.)

Douglas-fir beetle infestations now total 32,860 acres in Colorado and Wyoming. It is estimated that 5,095,000 board-feet of Douglas-fir were killed in 1957. Most of the beetle activity is on the San Juan, Grand Mesa-Uncompahgre, Rio Grande, and San Isabel National Forests and adjacent private and State forest lands (table 4).

The San Juan National Forest is suffering the greatest timber mortality, where 13,260 acres of Douglas-fir type are infested. The Pagosa District has heavy infestations in the East Fork drainage and Blanco Basin area. The Piedra District has heavy infestations in the Sand Creek and Cold Creek drainages, Devil Mountain and Navajo Peak areas. Vallecito Creek drainage on the Pine District has increasing infestations above Vallecito Reservoir.

Table 3.--A comparison of acres and intensity of Black Hills beetle activity by forest (from 1956 and 1957 aerial surveys)

Forest [1]	Year	Intensity of infestation				
		Light	Moderate	Heavy	Very heavy	Total
		Acres				
Arapaho [2]	1956					
	1957	100				100
Denver Mtn. Parks	1956	410				410
	1957	760	250		20	1,030
Black Forest [3]	1956					
	1957	1,000	[4] 600	[4] 50	[4] 70	1,720
Grand Mesa-Uncompahgre	1956	2,360	2,250	1,640	20	6,270
	1957	2,690	460	10		3,160
Gunnison	1956	100	420	920		1,440
	1957	330	10	10		350
Pike	1956	4,710	410			5,120
	1957	2,840	600	10		3,450
Rio Grande	1956	3,070	1,230			4,300
	1957	1,360	280	100		1,740
Roosevelt	1956	6,650	1,430	610		8,690
	1957	7,320	180			7,500
Routt [2]	1957	80				80
San Isabel	1956	7,370	720	260		8,350
	1957	7,910	1,080			8,990
San Juan	1956	3,380	2,460			5,840
	1957	8,730	540			9,270
White River [2]	1957	590	10			600
Bighorn	1956	2,670	3,070	100	310	6,150
	1957	460	180	20		660
Medicine Bow	1956	1,430	210			1,640
	1957	150				150
Black Hills [2]	1957	17,940	150	20		18,110

[1] Includes State and private lands.
[2] No infested trees spotted in 1956.
[3] Area not covered in 1956.
[4] Trees heavily infested with mistletoe.

On the Uncompahgre National Forest, infestations increased in size and intensity (moderate to heavy) in Kelso Creek and All Fork of Escalante Creek. These infestations are on the Uncompahgre Plateau. A heavy infestation on East Baldy Peak, southeast of Ridgeway, Colorado, increased in area.

Two field control tests using an ethylene dibromide emulsion showed a high mortality of Douglas-fir beetles in the callow adult stage. Both tests, Derby Mesa on the White River National Forest in 1956 and Pikes Peak on the Pike National Forest in 1957, showed that on trees with an average bark thickness of 1 inch or less, 91.6 percent of the beetles were killed.

MOUNTAIN PINE BEETLE

(*Dendroctonus monticolae* Hopk.)

Light to heavy infestations cover 12,780 acres of lodgepole and limber pine type on the Shoshone National Forest in northern Wyoming (table 5). The estimated loss in 1957 was 4,272,400 board-feet. Infestations on the Wapiti and Wind River Districts are epidemic.

Surveys in the fall of 1957 on the North Fork of the Shoshone River and its tributaries (Wapiti District) revealed 3,000 trees needing treatment in 1958. The infestation borders the highway to the east entrance of Yellowstone Park; the esthetic value of these adjacent lodgepole stands is high. In this area, 6,167 trees were treated in 1957 with an emulsion of ethylene dibromide.

The heavy infestation on Belknap Creek, a tributary of the South Fork of the Shoshone River (Wapiti District), received chemical control; 1,235 infested limber pines were treated with an emulsion of ethylene dibromide. Surveys revealed approximately 1,100 infested limber pines to the east of the controlled area. This area is scheduled for treatment in 1958.

The Wiggins Creek infestation on the Wind River District is epidemic. An estimated 7,500 lodgepole pines are infested. Control by logging is proposed for this area in 1958.

The 1957 aerial survey recorded a large group of faders on Geyser Creek (Wind River District). An inspection survey in September disclosed 56 infested limber pines. These trees were subsequently treated with an emulsion of ethylene dibromide.

Table 4.--A comparison of acres and intensity of Douglas-fir beetle infestations by forest (from 1956 and 1957 aerial surveys)

Forest 1/	Year	Intensity of infestation				
		Light	Moderate	Heavy	Very heavy	Total
		Acres				
Denver Mtn.	2/1956					
Parks	1957	50	50	10		110
Grand Mesa-	1956	2,250	9,830	3,790		15,870
Uncompahgre	1957	1,130	3,740	1,410	300	6,580
Gunnison	1956	1,030	610	310		1,950
	1957	360	440	50		850
Pike	1956	2,250	2,050			4,300
	1957	150	150	500		800
Rio Grande	1956	1,440	310			1,750
	1957	2,420	2,820	640		5,880
Roosevelt	1956	1,330				1,330
	1957	80	180	50		310
Sangre de	3/1956					
Cristo Grant	1957	1,150	130	250		1,530
San Isabel	1956	1,440	1,840			3,280
	1957	1,100	770	410		2,280
San Juan	1956	3,480	10,140	920		14,540
	1957	2,400	9,660	1,120	80	13,260
White River	1956	200	820	510	510	2,040
	1957	220	50	130		400
Bighorn	3/1956					
	1957	40				40
Medicine Bow	1956	1,740	510			2,250
	1957	50	100			150
Shoshone	1956	30		20		50
	1957	30	640			670

1/ Includes State and private lands.
2/ No beetle-killed trees spotted in 1956.
3/ Area not covered in 1956.

Table 5.--A comparison of acres and intensity of mountain pine beetle infestations by forest (from 1956 and 1957 aerial surveys)

Forest	Year	Intensity of infestation				
		Light	Moderate	Heavy	Very heavy	Total
		Acres				
Bighorn	1956	410				410
	1/ 1957					
Shoshone	1956	17,820	10,250	3,600		31,670
	1957	5,860	6,600	260		12,780

1/ No mountain pine beetle activity observed in 1957

WESTERN BALSAM BARK BEETLE
(*Dryocetes confusus* Sw.)

and

FIR ENGRAVER
(*Scolytus ventralis* Lec.)

Increasing infestations totaling 64,050 acres occur throughout the spruce-fir type in Colorado and Wyoming. The estimated volume loss is 4,881,800 board-feet.

The subalpine fir on the Grand Mesa-Uncompahgre, Rio Grande, White River, and San Juan National Forests is the most heavily infested (table 6). Lack of host material has reduced the acres of infestation on the White River, particularly in the Flat Top area northwest of Glenwood Springs, Colorado. Here, over the past several years, insects have destroyed nearly all the subalpine fir.

Table 6.--A comparison of 1956 and 1957 fir engraver infestations by national forests (from aerial surveys)

Forest	Year	Intensity of infestation				
		Light	Moderate	Heavy	Very heavy	Total
		Acres				
Arapaho	1956	1,120	3,890	1,130		6,140
	1957	1,380	1,150	280		2,810
Grand Mesa-Uncompahgre	1956	11,060	11,880	820		23,760
	1957	7,170	8,380	1,000	50	16,600
Gunnison	1956	4,710	2,250	200		7,160
	1957	1,630	1,790	80		3,500
Pike	1956		1,740			1,740
	1957	150	300	10		460
Rio Grande	1956	7,580	8,910	1,120		17,610
	1957	1,480	11,410	1,400		14,290
Rocky Mtn. National Park	1956	1,640	310			1,950
	1957	1,360				1,360
Roosevelt	1956	2,250		510		2,760
	1957	330	100	80		510
Routt	1956	4,920	2,770			7,690
	1957	1,100	540	100		1,740
San Isabel	1956	1,020	920			1,940
	1957			100	30	130
San Juan	1956	5,220	1,840			7,060
	1957	3,170	1,480	210		4,860
White River	1956	29,390	23,550	3,170	920	57,030
	1957	5,440	5,220	2,310	100	13,070
Bighorn	1956	3,480	2,250	410		6,140
	1957	590	660	20		1,270
Medicine Bow	1956	4,300	5,630	2,050		11,980
	1957	1,130	1,340	540		3,010
Shoshone	1956	820	1,540			2,360
	1957	310	100	30		440

SPRUCE BUDWORM

(*Choristoneura fumiferana* (Clem.))

Light to heavy spruce budworm defoliation is present on 89,500 acres of Douglas-fir, subalpine fir, spruce and ponderosa pine in southwestern Colorado. These infestations are confined to the Rio Grande and San Juan National Forests (table 7). Ninety-three percent of the infested acreage is classed as lightly defoliated.

Table 7.--A comparison of 1956 and 1957 spruce budworm infestations by national forest

Forest	Year	Intensity of infestation				
		Light	Moderate	Heavy	Very heavy	Total
		Acres				
Rio Grande	1956	16,180	15,160	2,870		34,210
	1957	23,430	5,610	890		29,930
San Juan	1956	4,100	1,130			5,230
	1957	59,570				59,570

The only recorded budworm damage on the Rio Grande National Forest is on the Del Norte District. A comparison of the 1956 and 1957 aerial surveys (table 8) shows the infestation to be declining in size and intensity.

Table 8.--A comparison of the 1956 and 1957 spruce budworm infestations on the Del Norte District, Rio Grande National Forest

Year	Intensity of infestation				
	Light	Moderate	Heavy	Very heavy	Total
	Acres				
1956	16,180	15,160	2,870		34,210
1967	23,430	5,610	890		29,930

Centers of light defoliation were found on the Pagosa, Piedra, Pine, Animas, and Engineer Districts of the San Juan National Forest.

GREAT BASIN TENT CATERPILLAR

(Malacosoma fragilis (Stretch))

The Great Basin tent caterpillar is epidemic on 132,310 acres of quaking aspen in southern Colorado. Defoliation is heavy on the Spanish Peaks District of the San Isabel National Forest, the Conejos District of the Rio Grande, and the Pagosa and Piedra Districts of the San Juan (table 9). Aspen stands on adjacent private and State lands are also infested.

Table 9.--Great Basin tent caterpillar infestations recorded during the 1957 aerial survey 1/

Area	Intensity of infestation				
	Light	Moderate	Heavy	Very heavy	Total
	Acres				
Grand Mesa-Uncompahgre N. F. 2/	2,860	390			3,250
Rio Grande N. F. 2/		4,920	26,880		31,800
San Isabel N. F. 2/	9,250	3,250	10,930		23,430
San Juan N. F. 2/	2,360	10,730	5,220		18,310
Sangre de Cristo Grant	10,240	17,820	19,100		47,160
C. F. & I. Lands		1,580	6,780		8,360

1/ The 1956 aerial survey did not record all the infestations, as many had refoliated before the survey began.

2/ Includes State and private lands within or adjacent to boundaries.

The present epidemic began in or before 1949. Since then it has resulted in serious losses in aesthetics, recreation, and growth increment.

In 1954, egg mass counts as a means of measuring population trends were begun. Sampling has been conducted annually since then. In 1957, egg mass counts indicated an overall downward trend of caterpillar populations, with some areas still at high epidemic levels (table 10).

Summer home residents in the heavily infested areas are concerned about the caterpillars. In some localities aspen is the main tree species. On the Conejos District of the Rio Grande National Forest (see table 10 -- McIntyre summer home) defoliation was heavy in 1957 and predictions based on egg mass counts are for heavy defoliation in 1958. The highest egg mass counts obtained during the 1957 sampling were on Cumbres Pass on the same forest.

Another troublesome area is in the vicinity of the Cucharas Camps. Heavy caterpillar defoliation of the aspen caused losses in esthetics and polluted the water. In the spring of 1955 approximately 1,600 high-use acres along the Cucharas River were sprayed with DDT by airplane. Excellent, but temporary, control resulted. The area was resprayed in 1957. The second spraying will have longer beneficial effects. A disease, probably a virus, has killed large numbers of caterpillars in surrounding areas; thus, fewer moths invaded the sprayed area during the flight and oviposition period.

LARGE ASPEN TORTRIX

(*Archips conflictana* (Wlkr.))

Visible leaf damage by the large aspen tortrix was recorded on 81,370 acres of aspen type in southwestern Colorado. Centers of light to moderate infestations are present on the Grand Mesa, the Muddy Springs District of the Gunnison National Forest and Dolores and Pine Districts of the San Juan National Forest.

Generally the infestations are lighter than in 1956 (table 11). Although not fully investigated, this reduction in acres of infestation may be due to a high rate of parasitism of larvae and pupae.

Table 10.--Relationship of number of caterpillar egg masses per branch to intensity of 1957 defoliation and defoliations forecast for 1958

Name of area	Egg masses per branch 1/			Intensity of infestation 1957	Defoliation forecast 1958
	1955	1956	1957		
	- -	No.	- - -		
Cucharas Camps (sprayed with DDT) San Isabel N. F.	0.8	1.5	0.4	heavy	light
Cucharas Camps (sprayed with DDT)	.5	2.6	.2	heavy	light
Cucharas Pass (not sprayed with DDT) heavy virus area		5.0	.5	heavy	medium
N. Fork Purgatoire Creek 2/ San Isabel N. F.	3.2	2.1	1.2	heavy	heavy
Whiskey Creek 2/ private	3.4	.9	.5	medium-heavy	medium
N. Fork Culebra Creek Trinchera Ranch private	3.4	1.4	1.3	heavy	very heavy
Culebra Creek, private			.9		medium
Bighorn area Rio Grande N. F.	3.9	3.3	.6	heavy	medium
McIntyre Summer Home Group Rio Grande N. F.	2.8	2.3	2.6	heavy	very heavy
Cumbres Pass Rio Grande N. F.			3.6		very heavy

1/ For practical purposes the number of masses per branch indicate the intensity of defoliation as follows: 0 - .4 = light, 0.5 - .9 = medium, 1.0 - 1.3 = heavy, 1.3 and more = very heavy.

2/ On Walsenburg and Trinidad watersheds.

Table 11.--A comparison of 1956 and 1957 large aspen tortrix infestations by national forests

Forest 1/	Year	Intensity of infestation				
		Light	Moderate	Heavy	Very heavy	Total
		Acres				
Grand Mesa-Uncompahgre	1956	19,860	100,860	1,950		122,670
	1957	51,280				51,280
Gunnison	1956	44,130	21,100			65,230
	1957	25,570				25,570
San Juan	1956	59,290	18,840			78,130
	1957	3,250	980	290		4,520

1/ Includes State and private lands adjacent to national forest boundaries.

PINE NEEDLE MINER

(Recuvaria Sp.)

A total of 15,590 acres of ponderosa pine needle damage caused by a species of pine needle miner was found during the 1957 aerial survey. This infestation is on the San Isabel National Forest and adjacent forested lands near Rye, Colorado. At the time of the examination of the foliage in mid-July, 20 to 30 percent of the 1956 needles were mined. Many of the insects had emerged; the remainder were still in pupal cases within the needles. No eggs were found at the bases of the 1957 needles.

MISCELLANEOUS INSECTS

The Engelmann spruce weevil (Pissodes engelmanni Hopk.) has damaged terminal shoots of an estimated 5 percent of the blue spruce and Engelmann spruce on the Poudre District, Roosevelt National Forest. The infestation is in the Buckhorn Creek drainage bottom and extends east from the Buckhorn Ranger Station for about 5 miles. The damaged trees are 10 to 25 feet high. The infestation probably started 3 years ago and at present appears static. The insect spends the winter in the adult stage, generally beneath the duff of the infested trees. At the time of the inspection survey in late November, no live insects were found in either the duff or infested shoots.

An infestation of western pine tip moth (Rhyacionia frustrana bushnelli (Busck.) is causing damage to ponderosa pine in Red Canyon, Black Hills National Forest.

Limber pine cones infested with an unidentified species of the genus Conophthorus were collected in Nebraska just east of Pine Bluffs, Wyoming.

RANGE INSECTS

June beetle grubs (Phyllophaga sp.) reduced the carrying capacity of approximately 6,000 acres of grazing land in the Black Hills from 2 acres per cow month to 10-12 acres per cow month. The grubs appear to prefer prairie dropseed (Sporobolus heterolepsis Gray), an excellent forage grass. With prairie dropseed destroyed by the root feeding of the grubs, less palatable plants and weeds are invading. The denuded areas are being damaged by severe wind erosion.

The desert shrub type of the Badger Wash Study Area in Mesa County, Colorado, is being seriously damaged by a variety of insects. The roots of rabbitbrush plants examined were infested with wood-boring larvae. Colonies of termites are attacking roots of rabbitbrush. Scale insects were collected from stems of shadscale. Caterpillars of the hawk moth were defoliating rabbitbrush. The area has been heavily grazed by sheep and cattle, depleting the native grass stands. This could be a factor in the now severe insect damage to the desert shrub type.

Table 12.--Summary of forest insect infestations recorded during the 1956 and 1957 aerial surveys in Colorado, Wyoming, and South Dakota

Insect	Year	Infestations by intensities				
		Light	Moderate	Heavy	Very heavy	Total
		Acres				
Fir engraver beetle	1956	77,510	67,480	9,410	920	155,320
	1957	25,240	32,470	6,160	180	64,050
Black Hills beetle	1956	32,150	12,200	3,530	330	48,210
	1957	52,260	4,340	220	90	56,910
Douglas-fir beetle	1956	15,190	26,110	5,550	510	47,360
	1957	9,180	18,730	4,570	380	32,860
Mountain pine beetle	1956	18,230	10,250	3,600		32,080
	1957	5,860	6,660	260		12,780
Engelmann spruce beetle	1956	3,550	1,280			4,830
	1957	1,090	1,010	100		2,200
Subtotal	1956	146,630	117,320	22,090	1,760	287,800
	1957	93,630	63,210	11,310	650	168,800
Spruce budworm	1956	20,280	16,280	2,870		39,430
	1957	83,000	5,610	890		89,500
Great Basin tent caterpillar	1956	12,080	42,600	42,600		97,280
	1957	24,710	38,690	68,910		132,310
Large aspen tortrix	1956	123,280	140,800	1,950		266,030
	1957	80,100	980	290		81,370
Pine needle miner	1956					
	1957	15,590				15,590
Subtotal	1956	155,640	199,680	47,420		402,740
	1957	203,400	45,280	70,090		318,770
Grand Total	1956	302,270	317,000	69,510	1,760	690,540
	1957	297,030	108,490	81,400	650	487,570

Table 13.-- Summary of number of trees killed by insects in 1956 as recorded by the 1957 aerial survey

Insect	Infestation by intensities				
	Light	Moderate	Heavy	Very heavy	Total
			Trees		
Engelmann spruce beetle	330	610	120		1,060
Black Hills beetle	10,450	1,740	1/1,291	140	1/13,621
Douglas-fir beetle	2,750	11,240	5,480	910	20,380
Mountain pine beetle	2,930	9,990	2/8,442		2/21,362
Fir engraver	7,570	19,480	7,390	430	34,870
Total	24,030	43,060	22,723	1,480	91,293

1/ Includes 1,121 trees treated on Uncompahgre National Forest.
2/ Includes 7,402 trees treated on Shoshone National Forest.

Table 14.-- Summary of volume of board-feet lost to bark beetles in 1956 as recorded during the 1957 aerial survey

Insect	Volume by intensities				
	Light	Moderate	Heavy	Very heavy	Total
			Volume M b.m.		
Engelmann spruce beetle	69.3	128.1	25.2		222.6
Black Hills beetle	2,090.0	348.0	258.2	28.0	2,724.2
Douglas-fir beetle	687.5	2,810.0	1,370.0	227.5	5,095.0
Mountain pine beetle	586.0	1,998.0	1,688.4		4,272.4
Fir engraver	1,059.8	2,727.2	1,034.6	60.2	4,881.8
Total	4,492.6	8,011.3	4,376.4	315.7	17,196.0

Table 15.-- Summary of forest insect control - trees treated in 1957 and plans for 1958

Insect	Forest	Trees treated in 1957		Trees proposed for treatment in 1958	
		Trees	Cost	Trees	Cost
		No.	Dollars	No.	Dollars
Fir engraver		None		None	
Black Hills beetle	Bighorn	165	680	300	1,500
	Black Hills	2,845	11,710	3,810	18,620
	Uncompahgre	1,121	10,180	None	
	Pike	None		2,000	10,400
	Rio Grande	64	280	None	
	Roosevelt	None		200	1,200
	San Isabel	752	8,560	650	4,880
	San Juan	98	410	200	1,000
Black Hills beetle totals		5,045	31,820	7,160	37,600
Douglas-fir beetle	Pike	399	2,650	None	
Mountain pine beetle	Shoshone	7,402	51,000	4,100	23,500
Engelmann spruce beetle	Gunnison	1/	90	None	
	Routt	None		800	3,500
	San Juan	60	260	None	
	White River	2/ 20	15	20	120
Engelmann spruce beetle totals		80	365	820	3,620
Great Basin tent caterpillar	San Isabel	1,600 acres - $1,500			

1/ Traps, long butts and culls.
2/ Twenty trees felled at 75¢ = $15.00.